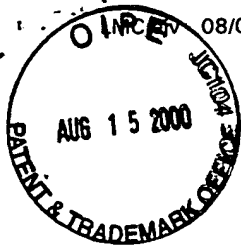


GAU 2814



08/08/00 6047-51973 13630

PATENT
Attorney Reference No. 6047-51973

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

In re application of:

Art Unit: 2814

Terry L. Gilton and Li Li

Application No. 09/321,518

Filed: May 27, 1999

For: SEMICONDUCTOR FABRICATION
METHODS AND APPARATUS

Examiner: B. Souw

Date: August 8, 2000

CERTIFICATE OF MAILING

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Attorney for Applicant

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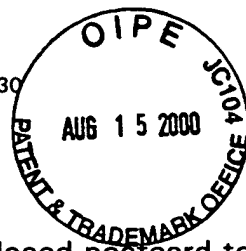
CLAIMS AS AMENDED					
For	No. after amendment	No. paid for previously	Present Extra	Rate	Fee
Total Claims	18	- 46*	= 0	\$18.00	\$ 0.00
Indep. Claims	8	- 16**	= 0	\$78.00	\$ 0.00
Mult. Dep. Claims Fee (if not previously paid)				\$260.00	
One-month Extension of Time				\$110.00	
Two-month Extension of Time				\$380.00	
Three-month Extension of Time				\$870.00	
TOTAL ADDITIONAL FEE FOR THIS AMENDMENT					\$0.00

* greater of twenty or number for which fee has been paid.

** greater of three or number for which fee has been paid.

☒ No additional fee is required.

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PATENT

Attorney Reference No. 6047-51973

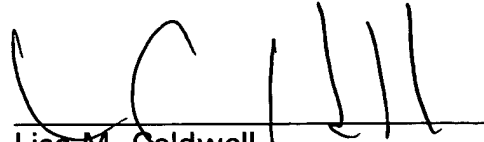


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Respectfully submitted,

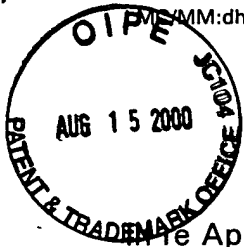
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PATENT
Atty. Ref. No. 6047-51973

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8-23-00
L. Spruell

IN THE UNITED STATES PATENT AND TRADEMARK OFFICE

Re Application of:

Art Unit: 2814

Terry L. Gilton and Li Li

Application No. 09/321,518

Filed: May 27, 1999

For: SEMICONDUCTOR FABRICATION
METHODS AND APPARATUS

Examiner: Bernard E. Snow

Date: August 8, 2000

CERTIFICATE OF MAILING

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AMENDMENT

In response to the Office Action dated May 8, 2000, please amend the claims of the above-captioned application as follows:

✓
Please cancel non-elected claims 1-38.

39. (Once Amended) An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

- a chamber sized to receive at least one wafer to be cleaned;
- a solvent applicator coupled to the chamber and adapted to vaporize and apply a solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to form a film of liquid solvent on said at least one of the first and second wafer side surfaces;

*Sub
C1
omd*
(corrected)

a temperature controller positioned and operable to maintain the at
least one wafer at a temperature equal to or lower than about a dew point of the
solvent;

a gas source of at least one reactive gas coupled to the chamber so
as to deliver such gas to the chamber, ~~the~~ at least one reactive gas being selected
to chemically react with the surface of the wafer to clean the wafer; and wherein
the liquid solvent comprises a transport medium which carries at least
some of the at least one reactive gas through the film to said at least one of the
first and second wafer side surfaces where the at least one reactive gas chemically
reacts with said at least one of the first and second wafer side surfaces.

*Sub
B3*

42. (Once Amended) An apparatus for delivering ozone gas to the
surface of a wafer comprising:

a wafer receiving chamber;

a wafer carrier positioned within the chamber [and carrying at least
one wafer];

A2

at least one wafer positioned in the wafer carrier in a substantially
vertical position within the wafer receiving chamber;

a liquid depositor adapted to produce a stream of liquid and form a
layer of the liquid on at least one major surface of a wafer supported by the wafer
carrier within the chamber, wherein the stream is produced in a direction
substantially parallel to the at least one major surface of the wafer;

an ozone gas source coupled to the chamber so as to deliver ozone
gas to the chamber and increase the concentration of ozone gas within the
chamber;

the liquid layer transporting ozone gas to the surface of the wafer to
thereby expose the wafer surface to ozone.

44. (Once Amended) An apparatus for cleaning semi-conductor wafers comprising:

- Sub
Cg
- a chamber sized to receive at least one wafer to be cleaned;
- a reactant gas source inlet and outlet, the inlet and outlet each communicating with the chamber and defining a gas flow path for reactant gas from the inlet to the outlet;
- a reactant gas source coupled to the inlet such that reactant gas is delivered from the inlet and flows in the gas flow path to the outlet;
- a wafer carrier positioned within the chamber and supporting at least one wafer at least partially in the gas flow path;
- a liquid layer former coupled to the chamber and operable to form a layer of liquid on at least one major surface of a wafer supported within the chamber, the liquid being selected so as to be substantially non-chemically-reactive with the reactant gas, whereby the reactant gas is transported through the liquid layer to the wafer surface, the reactant gas being selected so as to chemically react with components on the surface of the wafer to clean the wafer; and
- a temperature controller configured and operable to cool the at least one wafer in the chamber such that the liquid layer on the at least one major surface of the wafer is formed by condensation.
- A3

46. (Once Amended) An apparatus for stripping photo-resist from semi-conductor wafers comprising:

- a film former adapted to condense a solvent to form a film of liquid solvent onto a surface of the wafer which is to be stripped of photo-resist;
- a gas exposer adapted to expose the film of liquid solvent to a source of at least one reactant gas which is substantially non-chemically reactive with the solvent and which is chemically reactive with the photo-resist so as to strip the photo-resist from the wafer surface; [and]
- a cooling mechanism operable to cool the surface of the wafer; and
- A4
Sub
Cg

4. *sub CA comd.* whereby reactant gas is transported through the film of liquid solvent to the wafer surface.

✓ Please add new claims 47-56 as follows:

47. An apparatus according to claim 39, wherein the concentration of dissolved gas in the solvent is between about 10% and about 95% by volume.

48. An apparatus according to claim 39, wherein the apparatus includes a temperature controller adapted to cool and maintain the wafer at or below ambient temperature.

49. An apparatus according to claim 39, wherein the solvent is a perfluorocarbon.

50. An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:
a chamber sized to receive at least one wafer to be cleaned;
a solvent applicator coupled to the chamber and adapted to provide a vaporized solvent to at least one of the first and second side surfaces of the wafer positioned within the chamber so as to condense the vaporized solvent on the at least one of the first and second wafer side surfaces to form a thin layer of solvent thereon;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein

the solvent layer dissolves at least some of the at least one reactive gas in the film such that dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

51. An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

a chamber sized to receive at least one wafer to be cleaned;

a solvent applicator coupled to the chamber and adapted to vaporize a solvent and condense the solvent on at least one of the first and second side surfaces of the wafer positioned within the chamber so as to form a film of condensed liquid solvent on the at least one of the first and second wafer side surfaces;

a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein the condensed liquid solvent comprises a transport medium which dissolves at least some of the at least one reactive gas in the film to the at least one of the first and second wafer side surfaces where the at least one reactive gas chemically reacts with the at least one of the first and second wafer side surfaces.

52. An apparatus according to claim 51, further including a temperature controller to maintain the temperature of the wafer at the dew point of the vaporized solvent.

53. An apparatus according to claim 51, wherein the film of condensed liquid solvent has a thickness between about 1 micrometer and about 3000 micrometers.

54. An apparatus according to claim 51, wherein the concentration of dissolved gas in the solvent is between about 10% and 95% by volume.

55. An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

- a chamber sized to receive at least one wafer to be cleaned;
- a solvent applicator coupled to the chamber and adapted to drip solvent onto at least one of the first and second wafer side surfaces so as to form a film of liquid solvent on the at least one of the first and second wafer side surfaces;
- a temperature control device adapted to cool the at least one wafer;
- a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein the liquid solvent comprises a transport medium which dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

56. An apparatus for cleaning semi-conductor wafers, the wafers having first and second wafer side surfaces, the apparatus comprising:

- a chamber sized to receive at least one wafer to be cleaned;
- a nebulizer adapted to create a mist of a solvent;
- a temperature control device operable to cool the wafer such that the mist of solvent condenses on at least one of the first and second wafer side surfaces so as to form a film of liquid solvent on the at least one of the first and second wafer side surfaces;
- a gas source of at least one reactive gas coupled to the chamber so as to deliver such gas to the chamber, the at least one reactive gas being selected to chemically react with the surface of the wafer to clean the wafer; and wherein the liquid solvent comprises a transport medium that dissolves at least some of the at least one reactive gas in the film where the dissolved gas is brought

AS.
(continued)

into direct contact with and chemically reacts with the at least one of the first and second wafer side surfaces.

REMARKS

Claims 1-46 are pending in the application. By this amendment, claims 1-38 are canceled, claims 39, 42, 44, and 46 are amended, and new claims 47-56 have been added to further clarify the nature of the present invention. No new matter has been added.

I. Restriction Requirement

By this amendment, claims 1-38 are cancelled pursuant to the restriction requirement.

II. Rejection of Claims 39, 42, 44, and 46 Under 35 USC 102(a) and/or 102(e)

Claims 39, 42, 44, and 46 are rejected under 35 U.S.C. 102(a) and/or 102(e) as allegedly being anticipated by PCT No. WO 99/52654 to Bergman et al. Applicants transverse.

Applicants note that Bergman does not appear to qualify as prior art under § 102(a). There is not evidence that the invention was known or used by others in this country, or patented or described in a printed publication in this or a foreign country, before the invention thereof by the present inventor. The PCT application WO 99/52654 that forms the basis of the 102(a) rejection does not, by itself, support this allegation. There is no indication that the alleged invention disclosed in the Bergman foreign publication was known or used by others in this country. Further, mere existence of some pending US patent applications without disclosure of the contents of those applications is not sufficient to support a prima facie 102(a) rejection.